# CLAIMS

1.

An elastic fabric characterized by following matters.

(i) an elastic yarn is applied to warp yarns or weft yarns.

(ii) a breaking elongation of the elastic yarn is more than 60 %, and a rate of an elastic recovery after 15 % elongation of the elastic yarn is more than 90 %.

(iii) the elastic fabric has stress at 10% elongation of more than 150 N /5 cm and less than 600 N/5cm in the direction where the elastic yarn is in continuous without cut inside of the elastic fabric.

(iv) a rate of hysteresis loss $\Delta E$ which is calculated by the equation $\Delta E = 100 \times C / V = 100 \times (V - W) / V$ is 20 ~45 % ($20 \leqq \Delta E \leqq 40$).

At this ;

(i) V is integral value which is calculated by integrating load-elongation equation ( $f_0(\rho)$) from 0 % to 10 % elongation in the direction (X) where the elastic yarn is in continuous without cut inside of the elastic fabric, where load-elongation equation( $f_0(\rho)$ ) is defined by the loading curve ($f_0$) of the hysteresis in the load-elongation diagram.

(ii) W is integral value which is calculated by integrating load-elongation equation ($f_0$ ($\rho$)) from 10 % to 0 % elongation in the direction where the elastic yarn is in continuous without cut in the elastic fabric, where the load-elongation equation ( $f_0(\rho)$) is defined by the load-reducing curve ( $f_1$ ) of the hysteresis in the load-elongation diagram.

(iii) $C = V - W$ is value of hysteresis loss which is calculated as difference of values between integral values V and W .

2.

An elastic fabric as set forth in claim 1, wherein:

A density of a bulk ($J = T \times G$; dtex/cm) is set up more than 17000 dtex/cm.

At this, the density of bulk ( $J = T \times G$) is defined as a product value of the average fineness of an elastic yarn (T; dtex/number ) and the density of arrangement of the elastic yarn ($G = M / L$; number/cm)

which is calculated by dividing numbers of elastic yarns(M; number) by regular intervals(L; cm) in the orthogonal direction cross at right angles to the prolonging direction where elastic yarns prolong.

3.

An elastic fabric as set forth in any one of claims 1, wherein: stress at 10% elongation(B ; N/ 5 cm) in the 45 degrees bias direction , where has inclination of 45 degrees to the prolonging direction where elastic yarns prolong, is more than 5 % and less than 20 % in comparison with 10 % elongation stress(F; N/ 5 cm) in the prolonging direction where elastic yarns prolong .

4.

An elastic fabric as set forth in any one of claims 1, 2, 3, wherein:

Covering rate(K) is set up more than 30 %( $K = 100 \times M \times D/L \geqq 30\ \%$ ).

At this, the covering rate(K) is defined by dividing product value ( $M \times D$ ) of average diameter of the elastic yarn ( D ; cm), which is defined by square root of product value( $S \times k$ ) of modulus of elasticity( $k = 4 \times \pi^{-1}$) and the areas( S ; $cm^2$) of the cross section of the elastic yarns which are disposed in the regular intervals( L ; cm ) in the direction which crosses at right angles to the prolonging direction where the elastic yarns prolong, and numbers(M) of the elastic yarns which are disposed in the regular intervals(L;cm) by the regular intervals ( L : cm ).

5.

An elastic fabric as set forth in any one of claims 1, 2, 3, 4 wherein:

(i) the elastic fabric is woven by warp yarns and weft yarns ,

(ii) any one of pointed twill weaves, entwining twill weaves, herring-bone twill weaves, skip draft twill weaves, and modified twill weaves, where the continuity direction of intersections draw zigzag lines or radial lines, or any one of mat weaves, matt weaves, basket weaves , hopsack weaves, warp-weft weaves, irregular or fancy mat weaves, stitched mat weaves and other modified plain weaves, of which rate of the intersection ( $H = P/m$ ) is less than 0.5, is applied to the the elastic fabric .

At this, the rate of the intersection( H=P/m ) is defined by dividing the numbers(P) of bending points in front and/or in rear of intersections in the complete textile design of the woven elastic fabric , where the elastic yarn and the intersecting yarn bend and change their dispositions from surface side to back side or from back side to surface side one another, by the numbers(m) of the intersecting yarns which consist the complete textile design,

6.

An elastic fabric as set forth in any one of claims 1, 2, 3, 4, 5, wherein:

(i) the elastic fabric is woven by warp yarns and weft yarns ,

(ii) rate of the intersection( H=P/m), which is defined by dividing the number(P) of bending points in front and/or in rear of intersections in the complete textile design of the woven fabric , where the elastic yarn and the intersecting yarn bend and change their dispositions from surface side to back side or from back side to surface side one another, by the numbers(m) of the intersecting yarns which consist the complete textile design , is set up less than 0.5 ($H=P/m \leqq 0.5$) , and

(iii) product value($H \times K$) of rate of an intersection(H) and covering rate(K) of the elastic yarn is set up more than 0.1 ($H \times K \geqq 0.1$ ).

7.

An elastic fabric as set forth in any one of claims 1, 2, 3, 4, 5, 6, wherein:

(i) the elastic fabric is woven by warp yarns and weft yarns ,

(ii) density of bulk(J ; dtex/cm) of the elastic yarn is set up from 0.5 to 3.0 times of density of bulk(j;dtex/cm) of the intersecting yarn which crossing the elastic yarn at right angles ( $0.5 \times j \leqq J \leqq 3.0 \times j$ ).

At this, density of bulk(J;dtex/cm) of the elastic yarn is calculated as product value($T \times K$) of average fineness(T; dtex) and density of the arrangement( $G = n/L$ ; number/cm) of the elastic yarn which is calculated by dividing the numbers of elastic yarns( n; number) with the regular intervals(L ;cm) in the orthogonal direction crossing at right angles to the direction in which the elastic yarns prolong, and

bulk(j;dtex/cm) of the intersecting yarn , which is an inelastic yarn, is calculated as product value(t×k) of average fineness(t;dtex) and density of the arrangement(g=m/L ; number/cm) of the intersecting yarn which is calculated by dividing the numbers of intersecting yarns (m;number) by the regular intervals( L; cm) in the prolonging direction where the elastic yarns prolong .

8.

An elastic fabric as set forth in any one of claims 1, 2, wherein:

(i) the elastic fabric is a weft knitted fabric knitted by an inelastic yarns and an elastic yarns,

(ii) the elastic yarn is continue in line in the knitting width direction (Γ) over at least plural wales of at least one of plural courses, and

(iii) stress at 10% elongation(F) of the weft knitted fabric in the knitting length direction is set up more than 25 N/5 cm.

9.

An elastic fabric as set forth in any one of claim 8, wherein:

average diameter of the elastic yarn is set up more than 1.5 times of average diameter of the inelastic yarn .

10.

An elastic fabric as set forth in any one of claims 8, 9, wherein:

(i) at least two kinds of inelastic yarn of the first inelastic yarn (13a) and the second inelastic yarn applied to the weft knitted fabric (10), and the bace knitted fabric is formed from the first inelastic yarn,

(ii) the second inelastic yarn is knitted into the bace knitted fabric by appling float stitch knitting textile design and in a manner to form a needle loop together together with the first inelastic yarn at least in one of several courses every several needle loops, and

(iii) the sinker loop formed from the second inelastic yarn is extending in line in the knitting width direction over several wales from one needle loop formed together with the first inelastic yarn to another adjacent needle loop formed together with the first inelastic yarn.

11.

An elastic fabric as set forth in any one of claims 1, 2, 3, 4, 5, 6, 7, wherein:

(i) the elastic fabric is formed in three-dimensional constructions with a face fabric formed from face yarns and a back fabric formed from back yarns ,

(ii) the elastic yarn is applied to at least as one kind of back yarns.

12.

An elastic fabric as set forth in any one of claim 11, wherein:

the face fabric and the back fabric are connected by the connecting yarns which are not applied for forming of both face fabric and back fabric.

13.

An elastic fabric as set forth in any one of claim 12, wherein:

(i) the face fabric and the back fabric are connected by the connecting yarns which are not applied for forming of both face fabric and back fabric.

(ii) an interspace stratum which has a thickness of more than 0.3 mm is formed between the face fabric and the back fabric.

14.

An elastic fabric as set forth in any one of claims 12, 13, wherein:

(i) the face fabric and the back fabric are connected by the connecting yarns which are not applied for forming of both face fabric and back fabric.

(ii) the elastic yarn is applied to at least as one kind of back yarns, and

(iii) the face fabric is formed as a knitted net fabric which has openings having opening area of more than 1 $mm^2$.

15.

An elastic fabric as set forth in any one of claim 14, wherein:

two kinds of chain stitch openings are formed by the face yarn alternately every several courses,

each of the two kinds of chain stitch openings is formed over several courses,

one of the two kinds of chain stitch openings is formed together with one of the face yarns and other face yarn which is adjacent left side of the one of the face yarns in the knitting width direction , and another one of the two kinds of chain stitch openings is formed together with the one of face yarns and another face yarn which is adjacent right side of the one of face yarns in the knitting width direction .

16.

An elastic fabric as set forth in any one of claims 13, 14, 15, wherein: the back fabric is formed with the ground stitch back yarn for forming the chain stitch opening row extending in the knitting length direction and the inserted back yarn which is applied for connecting adjacent chain stitch opening rows without forming needle loops.

17.

An elastic fabric as set forth in any one of claims 13, 14, 15, 16, wherein:
the elastic yarn is applied for the connecting yarn.

18.

An elastic fabric as set forth in any one of claims 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, wherein:
the elastic yarn is thermally adhered to other yarns.

19.

An elastic fabric as set forth in any one of claims 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, wherein:
the tensile stresses, which act in any one of yarns continuous direction and also act respectively at least 2 apart portions being apart in the other direction crossing at right angles to that one of yarns continuous direction and also act at regular rate of elongation of the elastic fabric, are designed in various.

20.

An elastic fabric as set forth in any one of claims 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, wherein:

(i) two kinds of yarns are threaded in by directed to respectively different two directions which cross at right angles one another, and

(ii) the regular tensile strenghes, which act in the same direction where the yarn of the elastic fabric is in continuous in its length direction, are different between two portions, where are apart from one another in the direction, where any one of the two kinds of yarns is in continuous in it's length direction, and where any another one of the two kinds of yarns is in continuous across the one of the two kinds of yarns.

21.

An elastic fabric as set forth in any one of claims 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, wherein:

(i) lower stretch yarn and high stretch yarn are applied to the elastic fabric, and

(ii) at the regular strengh different positions of the elastic fabric, specifications of the elastic fabric are designed even in connection with textile design and density of threading.

22.

An elastic fabric as set forth in any one of claims 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, wherein:

the surface of the regular strengh different positions of the elastic fabric are covered with cut piles, loop piles or fluffs formed from the yarns which are even in connection with dyeing property, fineness, number of twist, and meterial of fiber.

23.

An elastic fabric as set forth in any one of claims 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, wherein:

average frictional modulus of elasticity( $\omega$) of the surface of the elastic fabric is designed more than 0.26( $0.26 \leqq \omega$) by appling a non-slip yarn which has fine fibers of a single fiber fineness less than 30 dtex to the elastic fabric, and by floating out the fine fibers over the surface of the elastic fabric in a manner of that the fine fibers float out or the non-slip yarn exposes at least among rectangular area of 1 $cm^2$

(lengthwise 1 cm × crosswise 1 cm ).

At this, average frictional modulus of elasticity($\omega$) of the surface of the elastic fabric is calcurated through following steps.

( Step i )

A rectangular test fabric taken out from the elastic fabric , size lengthwise 20 cm× crosswise 20 cm, is spreaded over and fixed on the surface of the metal plate which is finish in mirror plane and supported horizontally.

( Step ii )

A stainless rectangular contact segment having 20 lines of cut channel of width 0.1 mm and depth 0.1 mm over the undersurface, size lengthwise 10 mm × crosswise 10 mm, is put on the test fabric.

( Step iii)

Load of 50 gf is set on the test fabric through the contact segment.

( Step iv)

The contact segment is moved at speed of 0.1 mm/second to and from 30 mm in the right angled direction of the cut channel.

( Step v)

Frictional modulus of elasticity($\omega_1$) in the longitudinal direction of the elastic fabric is calculated by dividing average value of frictional force( $F_1$ ; gf ) between the contact segment and the test fabric by load 50 gf .

Frictional modulus of elasticity($\omega_2$) in the lateral direction of the elastic fabric is calculated by dividing average value of frictional force( $F_2$ ; gf ) between the contact segment and the test fabric by the load( 50 gf ).

Average frictional modulus of elasticity($\omega$) of the surface of the elastic fabric is calculated as average($0.5\omega_1 + 0.5\omega_2$) of frictional modulus of elasticity( $\omega_1$) in the longitudinal direction and frictional modulus of elasticity( $\omega_2$) in the lateral direction.

24.

An elastic fabric as set forth in any one of claim 23, wherein:
the elastic fabric is finished by raising its surface to nap the surface of the non-slip yarn exposed thereon.

25.

An elastic fabric as set forth in any one of claim 23, wherein:

the surface of the elastic fabric is covered with piles formed fron the non-slip yarn.

26.

An elastic fabric as set forth in any one of claim 23, wherein:

cord yarn, which has napped surface formed by cutting natural leather, synthetic leather, artificial leather, or non-woven fabric and has a fine fiber of fineness less than 30 dtex, is used for the non-slip yarn .

27.

An elastic fabric as set forth in any one of claim 23, wherein:

any one of following yarns is used for the non-slip yarn ;

(i) spun yarn and napped multifilament yarn having float fluffs,

(ii) ring yarn having ring like bumpy surface formed by annex yarns climb up a core yarn,

(iii) slub yarn having slub like bumpy surface formed by annex yarns climb up a core yarn,

(iv) nep yarn having nep like bumpy surface formed by annex yarns climb up a core yarn,

(v) seath core conjugate yarn having bumpy surface formed by covering core yarn by seath yarn, and

(vi) interlace yarn having bumpy surface formed by over feeding multifilament.

28.

An elastic fabric as set forth in any one of claim 23, wherein:

chenille yarn formed by fixing decorative yarn to core yarn is used for the non-slip yarn .

29.

An elastic fabric as set forth in any one of claim 23, wherein:

flocky yarn formed by electrostatically fixing fiber fragment to core

yarn is used for the non-slip yarn .

30.

An elastic top material characterized by following matters.

an elastic fabric as set forth in any one of claims 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, is hanged between frame parts which are projected at both sides of a frame, are apart one another, and are in opposite to one another, and is fixed both edges of the elastic fabric to the frame parts.